DOI: https://doi.org/10.30932/1992-3252-2020-18-6-46-62

Optimistic and Pessimistic Scenarios for Development of Feeder Network of the Arctic Transport System Based on Achievement of Target Indicators

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ABSTRACT

The relevance of the article is determined by the increasing role of the Arctic transport system in the economy of the Russian Federation: involvement of territories of the Arctic zone of the country in economic activities, an increase in their social and economic potential. The development of the northern territories is directly related to existing and future capabilities of the Arctic transport system, for successful functioning of which it is necessary to provide it with feeder transport network.

The objective of the work is to determine the scenarios according to which development of these feeder roads can be carried out. When writing the article, the methods of systemic, comparative, and statistical analysis were particularly used.

The paper clarifies the definition of the Arctic transport system. It is noted that scenarios for development of feeder routes to it should be linked to its general development, as well as to the development of the Arctic zone of the Russian Federation. The European and Ural Arctic subregion is highlighted, where development of feeder routes is most important in connection with the growth of economic activity on Yamal Peninsula. With reference to the works of domestic and foreign authors, strategic planning documents of the Russian Federation, it is assumed that according to the degree of achievement of target indicators of traffic volumes along the Northern Sea Route, optimistic and pessimistic scenarios for formation of feeder network can be activated. The final implementation of one of those scenarios is determined by political, natural, and other risks.

When developing scenarios for formation of transport feeder network to the Arctic transport system, the emergence of new modes of transport should be considered. New modes of transport can provide linking of remote objects to the trunk transport networks or eliminate the gaps emerging in them. The use of new modes of transport in the Russian Arctic should be carried out only after testing at specialized test sites, where their safety for transportation of passengers and goods, as well as for the environment, will be determined.

The work was carried out within the framework of the comprehensive program of fundamental scientific research of the Ural Branch of the Russian Academy of Sciences for 2018–2020 and is associated with the need to increase the capacity of the main ports of the European and Ural Arctic and the volume of traffic along the Northern Sea Route.

Keywords: Arctic transport system, Arctic zone of the Russian Federation, European and Ural Arctic, scenarios for development of transport feeder network, Northern Sea Route, target indicators.

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Article received 03.11 2020, revised 12.01.2021, accepted 14.01.2021.

For the original Russian text of the article please see p. 46.

Introduction. The formation of feeder transport network to the Arctic transport system (ATS) is aimed at meeting its needs while ensuring transportation of passengers and goods in the Arctic zone of the Russian Federation[1] (AZRF). Therefore, when developing scenarios for development of feeder transport network of ATS, one should consider the scenarios and forecasts for development of ATS and AZRF.

In accordance with the decree of the President of the Russian Federation «On the land territories of the Arctic zone of the Russian Federation»[2], the composition of the macroregion was determined. In connection with the growth of economic activity on the Yamal Peninsula, European and Ural Arctic (EUA) subregion was identified within the territories of the Russian Arctic, where development of transport approaches is most important. The EUA includes the territories of Murmansk region, Nenets autonomous district, municipalities (Arkhangelsk, Novodvinsk, Severodvinsk) and districts (Mezensky, Onezhsky, Primorsky) of Arkhangelsk region, municipal formation of the urban district «Vorkuta» of Komi Republic, Priuralsky and Yamal municipal districts of Yamalo-Nenets autonomous district. Later, Kostomukshinsky urban district, Segezha and Kalevala districts of the Republic of Karelia, the urban districts of Inta and Usinsk, as well as Ust-Tsilemsky district of the Komi Republic, Leshukonsky and Pinezhsky districts of Arkhangelsk region were added to them[3].

ATS is defined as a transport system that carries out transportation of goods and passengers in the Russian Arctic, consisting of trunk and local (feeder) transport subsystems.

The main trunk subsystems of ATS are the Northern Sea Route (NSR) with all its infrastructure and AZRF pipeline system. Also, the main subsystems include railway, road, air, and waterways connecting the transport system of the Russian Federation with the Arctic seaports and economic centres of AZRF. All other transport systems operating in AZRF belong to the local (feeder) transport subsystems of ATS.

Research sources

Analysis of forecasts for development of AZRF, proposals for development of a system of state statistical monitoring, construction of models for comprehensive development of the Arctic zone and for development of individual economic entities, implementation of investment projects are contained in the work [1, pp. 5–11].

The work [2, p. 28] substantiates a new approach to development of the northern and arctic territories of Russia through formation and development of a local national transport system, which is proposed to be carried out through relying on local specifics, interests, and institutions.

The authors of the work [3, p. 21] include construction of an interconnected network of railways and highways to ensure functioning of mining enterprises and wellbeing of the Arctic regions in a number of priority tasks.

The goals of ATS operation are somewhat contradictory. Ensuring the Northern Delivery [*annual organisation of state activities for delivery of goods to the region during the pre-winter season. – Translator's note*] does not raise doubts about its need. The export of hydrocarbons to the countries of Western Europe and the United States is positive in the sense that gas and oil producing enterprises make tax payments to the budgets of different levels, the employees of these enterprises receive relatively high salaries. At the same time, funds for development of the territories of the North of Russia are received in insufficient amounts.

In work [4, p. 6] it is noted that «problems of strategic management of the oil and gas complex in the Arctic constitute a multicomponent process that covers a number of important problems under geopolitical, economic, social, environmental aspects». These problems should be resolved at the state level, considering the interests of coastal regions, related industries and services, the interests of society in terms of compliance with environmental standards and creation of new jobs.

Reforms of the 1990s in Russia negatively affected the state of the transport system in the Arctic. Therefore, the Arctic transport system must be revived on a modern technological base [5, p. 553].

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[1] Strategy for development of the Arctic zone of the Russian Federation and ensuring national security for the period up to 2020 (approved by the President of the Russian Federation). Reference and legal system «Consultant Plus». [Electronic resource]: http://www.consultant.ru/document/cons_doc_LAW_142561/. Last accessed 25.09.2020.

[2] Decree of the President of the Russian Federation of 02.05.2014 No. 296 (as amended on 05.03.2020) «On the land territories of the Arctic zone of the Russian Federation». Reference and legal system «Consultant Plus». [Electronic resource]: http://www.consultant.ru/document/cons_doc_LAW_162553/. Last accessed 25.09.2020.

[3] Federal Law of 13.07.2020, No. 193 «On state support for entrepreneurial activity in the Arctic zone of the Russian Federation». Reference and legal system «Consultant Plus». [Electronic resource]: http://www.consultant.ru/document/cons_doc_LAW_357078/. Last accessed 25.09.2020.

It is also required to develop, and in some projects to re-create feeder network of the ATS.

The study [6] is devoted to the issues of attracting investment resources aimed at ensuring year-round navigation along the NSR. The author tries to solve the problems of combining numerous plans for implementation of investment projects into a single «megaproject» to attract investments aimed at development of AZRF, to identify ways of developing the financial and economic model of the Northern Sea Route, to highlight the investment component of the ATS Development Concept [6, p. 16].

In modern works of foreign researchers, much attention is paid to development of NSR and the state of the icebreaker fleet. Thus, assessment of the icebreaker fleet of states having interests in the Arctic is given in the article by F. Aston [7, pp. 48–51]. Economic calculations for the use of NSR as a transit route between Europe and Asia, considering the main factors, are given in the works of European authors [8, pp. 434–444; 9, pp. 977–983]. French scientists [10, pp. 107–117] assessed the technical and economic feasibility of using NSR for container shipping. Researchers from Southeast Asian countries are showing interest in NSR. For example, the work of Malaysian authors [11, pp. 85–98] considers the issues of increasing the influence of NSR on shipping activities in the Straits of Malacca, one of the key international trade routes.

Development of transport feeder network of the Arctic transport system

The feeder routes currently connecting the transport system of the Russian Federation with the Arctic seaports and economic centres of the Russian Arctic on the territory of the European and Ural North of Russia [EUNR] are listed in [12, p. 54].

The sections of transport infrastructure located in AZRF are constituent elements of the ATS. For example, the section of Obskaya–Bovanenkovo railway is a constituent element of the ATS in the Ural North, and the section of the Northern railway from Konosha station to the border of the Pechora municipal district and the municipal formation of the Inta urban district of the Komi Republic is a feeder route of the ATS. Feeder routes to seaports can be both part of feeder network of the ATS, and its constituent parts.

The functioning of the ATS has a direct impact on development of its feeder network and the territories where it is located [13, p. 8].

The ATS functioning can provide the greatest advantages for the northern seaports: Sabetta, Murmansk, Arkhangelsk, Kandalaksha, Naryan-Mar, Onega, the promising port of Indiga, river ports of Labytnangi and Pechora.

The railway stations of Oktyabrskaya and Northern railways [branches] of JSC Russian Railways provide freight traffic for the ATS, which gives employment to the population and tax revenues to the budgets of the constituent entities of the Russian Federation within the EUNR.

Under favourable development scenarios, the following elements will be added to the ATS feeder network:

1) Belkomur railway line will be one of feeder routes of the ATS, namely, to the deep-water seaport in Arkhangelsk region. The port itself will become an element of the ATS.

2) Sosnogorsk–Indiga railway (Barentskomur project) will become a land feeder route to the promising port of NSR Indiga.

3) Syktyvkar–Ukhta–Usinsk–Naryan-Mar highway with approach roads to Vorkuta and Salekhard is a newly formed feeder network element of the ATS.

Railway construction under the Northern latitudinal route project will be an integral part of the ATS. Bovanenkovo–Sabetta railway line («Northern latitudinal route-2») will be of great importance.

Factors affecting the content of scenarios for development of the Arctic transport system

In work [14, p. 10], the authors note the influence of several factors on the content of scenarios for development of the Arctic (physical and geographical features of the region; state of the world economy and demand for hydrocarbon resources; state of technology and their possession by a limited number of countries; state of international relations, etc.), and conditionally divide the prospects for development of the Arctic until 2035 into optimistic, pessimistic and intermediate ones.

In December 2019, the Government of the Russian Federation approved the Plan for development of the Northern Sea Route infrastructure until 2035 prepared by the State Atomic Energy Corporation Rosatom.

The plan is divided into three stages:

1) Until 2024, mainly the western part of NSR will be developed.

2) By 2030, it is planned to organise year-round shipping in the entire water area.

3) By 2035 the NSR should become the national transport corridor of the Russian Federation competitive in the world market[4].

In October 2020, the Strategy[5] for development of the Arctic Zone of the Russian Federation and provision of national security for the period up to 2035 was approved. The Strategy assessed the state of affairs, identified the main directions and tasks for development of AZRF, including those of individual constituent entities of the Russian Federation. The expected results, the main implementation mechanisms, and target indicators for development of AZRF have been determined.

Target-based scenarios

Targets[6] for reaching the traffic volumes at the NSR of 80 million tons by 2024 will activate two scenarios for development of the ATS and its feeder network: *optimistic* (the specified traffic volume will be achieved) and *pessimistic* (the named traffic volume will not be achieved) ones.

It is planned that the cargo base of NSR will be formed thanks to the projects listed in [12, p. 57]. In the schedule, the cargo traffic is determined at 81,9 million tons, of which 76,7 million tons will be achieved through the export of minerals. However, some experts question the feasibility of these plans. According to the estimates of the Analytical Centre under the Government of the Russian Federation, the volume will be of 53,8 million tons for the pessimistic scenario, 63,1 million tons in the baseline, and 76,4 million tons for the optimistic scenario[7].

The implementation of these plans will require strengthening of feeder network of the ATS, as well as of the seaports in AZRF.

The federal project «Sea Ports», which is part of the Comprehensive Plan for modernization and expansion of trunk infrastructure until 2024, provides for an increase in capacity of seaports by more than 330 million tons by the specified year. «To effectively solve this problem, an integrated approach and synchronization of development of port, railway and road infrastructures is required, first, development of near and long-distance feeder routes to ports», noted the ex-Minister of Transport of the Russian Federation E. I. Dietrich in his speech at the 13th International Forum «Transport of Russia-2019»[8].

The state in 2020–2022 will spend 1,4 trillion roubles to finance the Comprehensive Plan for modernization and expansion of the trunk infrastructure for the period up to 2024. Main objectives of the Comprehensive Plan comprise construction and modernization of Russian sections of highways related to the Europe–Western China international transport route, an increase in capacity of seaports of the Russian Federation to 1,3 billion tons, including the ports of the Far East, Arctic, North-West (Baltic), Volga-Caspian and Azov-Black Sea basins, development of the NSR, and an increase in cargo traffic along it to 80 million tons.

Implementation of the project «Integrated development of Murmansk transport hub» will require an increase in transit capacity along the long railway section Volkhovstroy–Murmansk. In early June 2020, the authorities of Murmansk region were forced to introduce a regional emergency due to destruction of the railway bridge across the river Cola[9], which led to disruption of movement of goods by rail. The emergency mode was in effect until completion of work on laying a backup line to Murmansk station. As a result, several large customers of Murmansk port redirected part of their cargo to Baltic ports[10]. The

[4] Decree of the President of the Russian Federation of 05.03.2020 «On the fundamentals of the state policy of the Russian Federation in the Arctic for the period until 2035». Reference and legal system «Consultant Plus». [Electronic resource]: http://www.consultant.ru/document/cons_doc_LAW_347129/. Last accessed 25.09.2020.

[5] Decree of the President of the Russian Federation of 26.10.2020 No. 645 «On the Strategy on development of the Arctic Zone of the Russian Federation and provision of national security for the period up to 2035». Reference and legal system «Consultant Plus». [Electronic resource]: http://www.consultant.ru/document/cons_doc_LAW_366065/. Last accessed 25.11.2020.

[6] Decree of the President of the Russian Federation of 07.05.2018 No. 204 (as amend. on 21.07.2020) «On national goals and strategic tasks of development of the Russian Federation for the period until 2024». Reference and legal system «Consultant Plus». [Electronic resource]: http://www.consultant.ru/document/cons_doc_LAW_297432/. Last accessed 25.09.2020.

[7] Expenditures for development of the Northern Sea Route were estimated at 900 billion roubles [Raskhody na razvitie Severnogo morskogo puti otsenili v 900 mlrd rublei]. [Electronic resource]: https://www.vedomosti.ru/economics/news/2019/01/21/791925-plan-osvoeniya-sevmorput. Last accessed 24.07.2020.

[8] Investments in ports and railways need synchronization [*Investitsiyam v porty i v zheleznuyu dorogu nuzhna sinkhronizatsiya*]. [Electronic resource]: http://morvesti.ru/analitika/1688/83520/?sphrase_id=3149684. Last accessed 08.05.2020.

[9] The regional emergency regime was introduced in the Murmansk region due to an accident on the railway bridge [*Regionalniy rezhim ChS vveli v Murmanskoi oblasti iz-za avarii na zh.d. mostu*]. [Electronic resource]: https://tass.ru/obschestvo/8710919. Last accessed 11.06.2020.

[10] Due to the collapsed bridge, part of cargo from Murmansk will go to the ports of the Baltic [*Iz-za rukhnuvshego mosta chast' gruzov iz Murmanska uidet v porty Pribaltiki*]. [Electronic resource]: https://www.rbc.ru/business/09/06/2020/5eda75319a7947558656f517. Last accessed 09.06.2020.

situation revealed the problem that «the nearest ports of the North-West, according to their technical features, can be used as an alternative to Murmansk port». At the same time, the promising port in the Indiga Bay can also be such an alternative option.

The process of climate change in the Arctic and the associated melting of permafrost poses serious risks[11]. This is a serious threat to permanent structures, which include transport facilities.

Is this the most likely scenario?

Until March 2020, it could be assumed that development of the ATS and its feeder network would proceed according to the optimistic scenario. The growth rates of freight traffic along the NSR even outpaced the forecasted values. In 2019, the total volume of cargo transportation along NSR increased by 56,7 % reaching 31,5 million tons (in 2018 this figure was of 20,1 million tons). In particular, 20,5 million tons of cargo were handled in the port of Sabetta, 1,5 million tons in the port of Dudinka and 7,7 million tons at the terminal near Cape Kamenny. The total number of transit journeys reached 37, the volume of transit cargo transportation in 2019 increased by almost 41,9 % and amounted to 697,2 thousand tons (as compared to 491,3 thousand tons in 2018)[12].

Events associated with spread of coronavirus infection have led to a drop in production in many countries. In this regard, the likelihood of the event developing according to the pessimistic scenario increases.

Regardless of that, in 2020 there was no decline in the volume of the ATS traffic compared to the volume of traffic in 2019: the cargo turnover along the NSR amounted to 32,97 million tons, which is almost 1,5 million tons more than in 2019[13]. However, the growth rates of traffic volumes must be more significant to achieve an increase in cargo traffic along NSR up to 80 million tons in 2024.

At the same time, the turnover of seaports of the Arctic basin in 2020 decreased by 8,4 % compared to 2019 and amounted to 96,0 million tons, of which the volume of dry cargo transshipment amounted to 30,1 million tons (-4,9 %), of liquid cargo to 65,9 million tons (-9,9 %)[14]. Freight turnover of main ports of European and Ural Arctic in 2019–2020 is shown in Pic. 1. It can be seen that there was a decrease in cargo turnover in the port of Murmansk (by 9,3 %) and in the port of Varandey (by 31,8 %), while the increase took place in the port of Arkhangelsk (by 22,4 %), and approximately the same volumes were maintained in the port of Sabetta.

The reduction in incomes of such monopolists as PJSC Gazprom, PJSC Lukoil and some others led to a reduction in funding of infrastructure projects, which comprise projects to develop feeder network of the ATS. Thus, Gazprom planned to spend on investments in 2020 a quarter less than a year earlier: 1,6 trillion roubles. Due to the worsened economic situation in 2020, the company decided to further cut costs by 20 % to 1,3 trillion roubles. This may lead to postponement of implementation of some investment projects planned for 2021–2024.

Perhaps, in these conditions, the target settings should be changed since strategic planning is primarily adaptive [15].

Priority should be given to the use of hydrocarbons for domestic consumption. The ATS feeder network should be used for development of the territories of AZRF, and for provision of the Northern Delivery.

Ensuring smooth operation of transport is a strategic challenge during the coronavirus pandemic. This was announced by the President of the Russian Federation V. V. Putin during a meeting on development of transport[15]. Opening it, the head of state urged to preserve investment programs of companies in the transport industry as much as possible. In addition, in the context of spread of coronavirus infection, international

[11] The Nornickel disaster is just the beginning. Half of the country is threatened by the melting permafrost [*Katastrofa «Nornikelya» – tolko nachalo. Polstrany pod ugrozoi iz-za tayaniya vechnoi merzloty*]. [Electronic resource]: https://pogoda.mail.ru/news/42182462/. Last accessed 15.05.2020.

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[14] Freight turnover of seaports of Russia for 12 months of 2020 [*Gruzooborot morskikh portov Rossii za 12 mesyatsev 2020*]. [Electronic resource]: https://www.morport.com/rus/news/gruzooborot-morskih-portov-rossii-za-12-mesyacev-2020-goda. Last accessed 24.12.2020.

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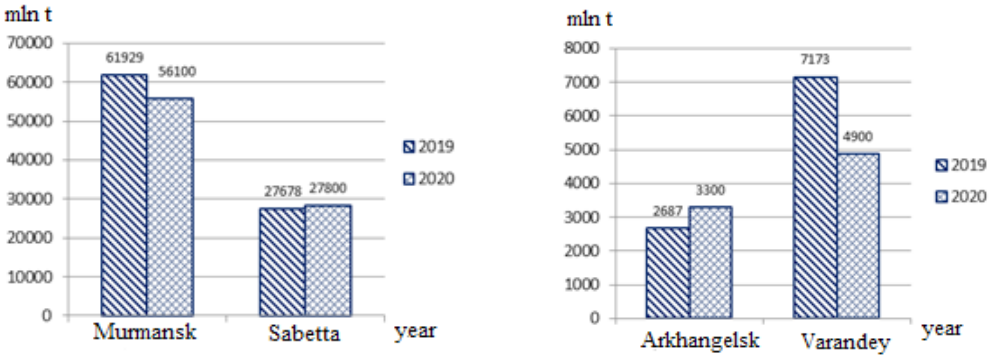

a) Murmansk and Sabetta *b) Arkhangelsk and Varandey*

Pic. 1. Cargo turnover of main ports of European and Ural Arctic in 2019–2020[14].

tourism has actually been stopped. In this regard, the head of state called on «to use the emerging reserves of the transport complex, to focus them on the development of domestic tourism and interregional transportation».

If the situation with ATS transportation develops according to the pessimistic scenario, the importance of construction of the deep-water seaport of Indiga and the railway to it from the city of Sosnogorsk will increase. This direction is the main one in implementation of the Strategy[16] in Nenets autonomous district.

With a focus on domestic consumption of petroleum products, it is necessary to increase the capacity for production of gasoline and diesel fuel in the area of the city of Sosnogorsk. Construction of a railway to the south from the city of Sosnogorsk through the settlement Troitsko-Pechorsk to the station Polunochnoe of Sverdlovsk railway will ensure transportation of hydrocarbons to the industrial regions of the Urals.

In addition, there are forecasts[17] that after the end of the pandemic in 2021, the growth of the economies of the Asia-Pacific region will resume. Thus, in the People's Republic of China in 2021, economic growth should resume at an increased rate up to the level of 7,3 %, and then the economy will return to its normal state. In India, economic growth is projected to pick up 6,2 % in fiscal year 2021 after a slowdown. Thus, the volumes of oil and liquefied natural gas unclaimed by Western economies can be redirected to the East.

Accounting for emergence of new modes of transport

Development of technology, new materials and design solutions contribute to emergence of new modes of transport, which, as they develop and achieve the required level of transport safety, can become operational, and this must be considered when developing scenarios for formation of ATS feeder network.

New modes of transport can provide linking of remote objects to trunk transport networks or eliminate the gaps arising in them. For example, during off-season periods, transport links between the cities of Salekhard and Labytnangi in Yamalo-Nenets autonomous district are provided by air-cushion vehicles (ACV, hovercraft)[18]. ACV are also used in Nenets autonomous district to connect the city of Naryan-Mar with the settlements of Nelmin Nos, Kuya, Andega, Oksino, Khongurei, Kamenka, Velikovisochny, Toshviski, Labozhskoe and Telviski during the inter-navigation period[19]. A problem of operation

[16] Decree of the President of the Russian Federation of 26.10.2020 r. No. 645 «On the Strategy of development of the Arctic Zone of the Russian Federation and provision of national security for the period until 2035». Reference and legal system «Consultant Plus». [Electronic resource]: http://www.consultant.ru/document/cons_doc_LAW_366065/. Last accessed 25.09.2020.

[17] Economic growth in developing countries in Asia will decline in 2020 due to the coronavirus (COVID-19) [*Ekonomicheskiy rost v razvivayushchikhsya stranakh Azii v 2020 godu spadet iz-za koronavirusa (COVID-19)*]. [Electronic resource]: https://www.adb.org/ru/news/developing-asia-growth-fall-2020-covid-19-impact. Last accessed 03.04.2020.

[18] Hovercraft launched on Salekhard-Labytnangi crossing [*Na pereprave «Salekhard–Labytnangi» zarabotali suda na vozdushnoi podushke*]. [Electronic resource]: http://west-zap.ru/auto/23955-na-pereprave-salehard-labytnangi-zarabotali-suda-na-vozdushnoy-podushke.html. Last accessed 25.09.2020.

[19] Northern Transport Company switches to an international navigation schedule [*Severnaya transportnaya kompaniya perekhodit na mezhnavigatsionnoe raspisanie*]. [Electronic resource]: https://nao24.ru/transport/17828-severnaya-transportnaya-kompaniya-perehodit-na-mezhnavigacionnoe-raspisanie.html. Last accessed 25.09.2020.

of the hovercraft is linked to frequent repair of engines.

A promising direction for development of air transport in exploration of northern territories can be linked to the use of specialized unmanned aerial vehicles (UAV). At the same time, due to the absence of a person or life support systems on board the aircraft, the cost of cargo transportation can be reduced. However, the main obstacle to the use of UAV is associated with the unsolved problem of safety during their movement in populated areas [16].

Among the promising developments that will be able to complement trains and cars in the future are magnetic levitation (maglev), vacuum, and string transport.

In China, a high-speed maglev line with an estimated speed of 600 km/h was successfully tested at Tongji University in Shanghai. China plans to commercialize a 500 km high-speed maglev line by 2025[20]. Shanghai–Hangzhou maglev road for movement at a speed of 600 km/h is officially included in the ten transport super-projects in Zhejiang province for the forthcoming years. After completion of the project in 2025, residents of Hangzhou will be able to reach the centre of Shanghai in 20 minutes. An extension of maglev route from Hangzhou to Ningbo is also planned.

To achieve breakthrough results in achieving increased speed of movement, it is promising to use magnetic levitation in combination with the use of a vacuum environment through creation of vacuum-levitation transport systems [17]. The businessman and inventor Elon Musk proposed the Hyperloop project, which is based on the use of vacuum tube trains[21]. Hyperloop vacuum tube trains will run through a special tunnel completely isolated from the outside environment at a speed of up to 1220 km/h. Several large companies from all over the world are involved in the project.

Systems based on Yunitskiy's string transport are actively developing in the Republic of Belarus. In the SkyWay[22] Eco-Technopark near Minsk, five demonstration and certification test complexes of different types with a total length of more than four kilometres and the entire infrastructure of the «second level» were built: stations, turnouts, engineering networks of water supply and sewerage, power supply systems with networks with a total capacity of about 1000 kW, communication systems and intelligent control equipped with a sensor system and technical vision.

Degradation of permafrost in the Arctic zone carries serious risks to transport infrastructure, railways and roads, oil and gas pipelines. A way to ensure transport accessibility of territories and remote industrial facilities in such conditions may be associated with development of small-sized flyover-type transport systems [18].

The use of new modes of transport in AZRF should be carried out only after testing them at specialized test sites, where their safety for transportation of passengers and goods, as well as the environment, will be confirmed. Such scientific testing grounds are being created, in particular, at the North-Eastern Federal University n.a. M. K. Ammosov[23]. At such test sites, experimental development of equipment will be carried out in the harsh weather conditions of the Arctic, and the results of the research will entail further improvement of structures and technologies.

Brief conclusions.

1) Development and maintenance of the Arctic transport system feeder network should be linked to development of ATS itself and the Arctic zone of the Russian Federation.

2) Political, environmental, epidemiological, natural disasters' risks and other ones might cause in turn risks for development of the ATS itself and its feeder network according to the pessimistic scenario.

3) To ensure the conditions for implementation of the optimistic scenario, investment programs in the transport industry should be maintained.

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[23] Matveev, D. Heavy road [*Tyazhelaya doroga*]. Website of JSC Kommersant. [Electronic resource]: https://www.kommersant.ru/doc/4602853/. Last accessed 17.12.2020.

4) When developing scenarios for formation of the ATS feeder network, one should consider the emergence of new modes of transport.

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